A Generalized Mixture Framework for Multi-label Classification

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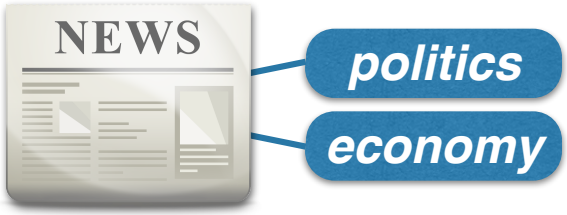
Target Problem: Multi-label Classification

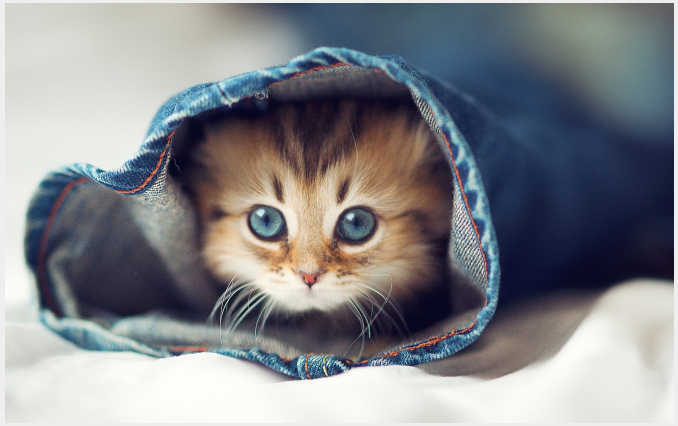
- In MLC, each data instance can be associate with multiple class variables
  - Examples



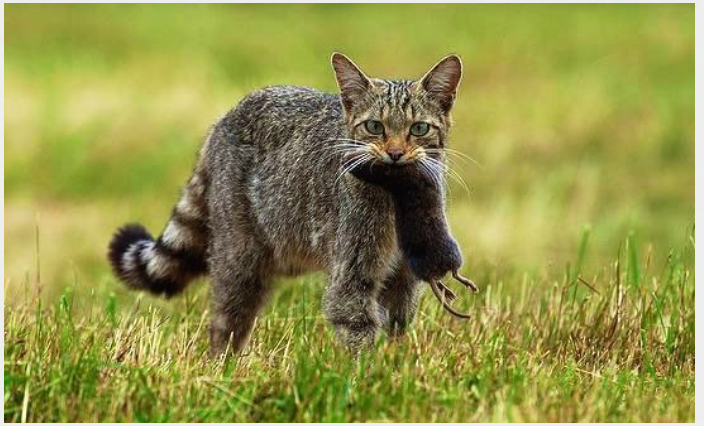
- One solution to the MLC problem is to exploit the dependency relation among class variables
  - We can efficiently perform learning and classification by assuming the dependency relation forms a chain or tree structure [Read et al. 2009; Batal et al. 2013]

Claim: Dependency relation in a dataset could be complex

- What if there exist multiple dependency relations that tend to change across a dataset?
  - Example



cat pet kitty



cat wildcat wild animal

- Existing methods may not be sufficient because they are designed to capture a fixed dependency relation

Our Solution: *Multi-label Mixtures-of-Experts (ML-ME)*

- We present a way to discover and exploit a rich set of dependency relations by developing a mixture [Jacobs et al. 1991] framework for the MLC problem
- Our framework incorporates multiple probabilistic MLC models
  - Each model decomposes the class posterior $P(Y_1, \ldots, Y_d|\mathbf{X})$ using a product of the posteriors over individual class variables
  - Using mixtures, we improve the prediction accuracy (exact match) up to 27% and the model fitness (conditional log-loss) up to 59%

Thanks & See You at the Poster Session!

- For more technical details and experimental results, please stop by our poster (Poster# 34)